12.0 FLIGHT OPERATIONS TEAM (FOT)

Mission operations as defined in this document will be performed by an AlliedSignal Technical Services Corporation (ATSC) provided FOT, organized in accordance with the staffing structure illustrated in Figure 12-1. Reference to the FOT, either in general or by specific staff position, relates to this organizational outline. Prime responsibilities of the TRMM FOT are to:

a. Ensure observatory health and safety.
b. Provide observatory operation as required to meet established mission objectives.
c. Interface with external support facilities to coordinate mission operations
d. Maintain daily operational continuity.

To satisfy these responsibilities, the FOT has correlated mission requirements to specific positions within the FOT. The TRMM staffing structure is based on flight-proven and effective real-time operations designs. The team organization encompasses key operational needs such as around-the-clock operations, position back-ups, operational integrity checks, and integral cross training capability.

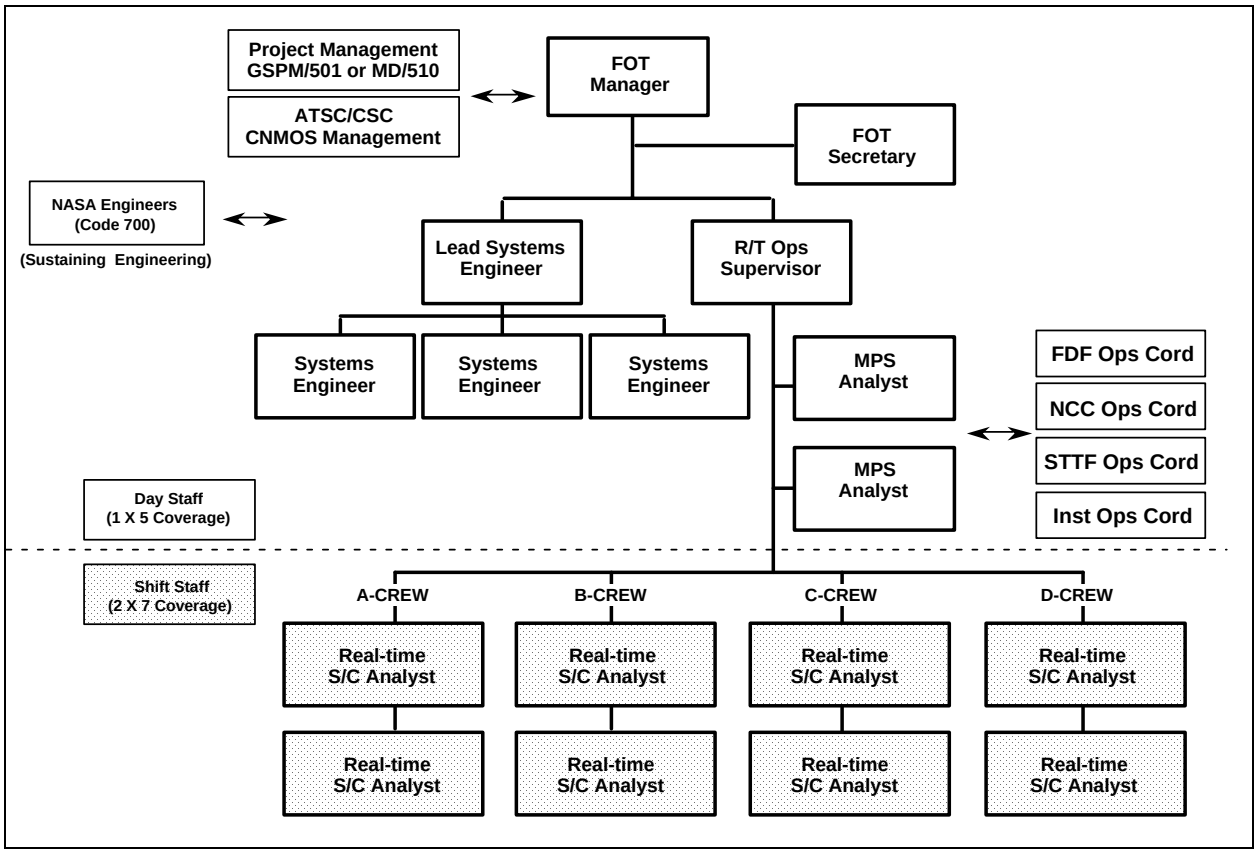

Figure 12-1 TRMM FOT Organization

12.1 FOT RESPONSIBILITIES

The following section provides a brief description of each FOT position. In addition, this section attempts to correlate mission responsibility to each position. As illustrated in Figure 12-1, the FOT consists of the following positions:

a. Flight Operations Team Manager (1)
b. Lead Spacecraft Systems Engineer (1)
c. Spacecraft Systems Engineer (3)
d. Real-time Operations Supervisor (1)
e. Mission Planning & Scheduling Analyst (2)
f. Real-time Spacecraft Analyst (8)

12.1.1 Flight Operations Team Manager

The FOT Manager is responsible for hiring and overall management of the FOT contractor staff. The manager will also hold the additional technical role of maximizing cross-mission reuse between TRMM and the X-Ray Timing Explorer (XTE) Specific responsibilities include:

a. Provide NASA-to-contractor task management interface (GSPM and MD).

b. Provide hiring and overall management of FOT contractor staff.

c. Provide employee performance evaluation and salary administration.

d. Provide FOT task cost management and contract modification coordination as necessary.

e. Provide operations status reporting to the customer and ATSC management.

f. Support working groups and meetings as necessary to effectively plan, coordinate, and carry out TRMM mission operations.

g. Identify opportunities for cost reductions through XTE mission reuse, continuous process improvements, new operations strategies, and other innovations.

12.1.2 Lead Spacecraft Systems Engineer

The Lead Spacecraft Systems Engineer has overall responsibility for all technical aspects of TRMM flight operations under direction of the FOT Manager. Specific responsibilities include:

a. Provides overall coordination of Mission Operations Center (MOC) activities and provides technical direction to the FOT staff.

b. Develops and supports administration of FOT training and certification program.

c. Acts as FOT's point-of-contact to NASA subsystem engineers (Engineering Directorate) for sustaining engineering support.

d. Coordinates configuration control of TRMM command procedures and telemetry displays.

e. Assists in TRMM telemetry, command, and Network Control Center (NCC) data base maintenance in the MOC.

f. Provides MOC Project Data Base (PDB) configuration management.

g. Leads all special investigation and troubleshooting efforts as related to spacecraft performance and anomaly recovery.

h. Acts as resident expert on TRMM FDS, C&DH, and Communications subsystems.

i. Performs ATSC administrative duties.

12.1.3 Spacecraft Systems Engineers

The TRMM FOT will be staffed with two Spacecraft Systems Engineers. The systems engineers provide the necessary engineering expertise to plan and coordinate special observatory operations such as attitude and orbit maneuvers. The systems engineers are the FOT points of contact for all spacecraft and instrument housekeeping concerns. Specific responsibilities include:

a. Develops detailed procedures for observatory commanding during all mission phases (L&IOC, Normal, Contingencies)

b. Performs in-depth observatory analysis, subsystem trending, performance evaluation, and reporting.

c. Supports all special investigation and troubleshooting efforts as related to spacecraft performance and anomaly recovery.

d. Provides coordination with NASDA for COMETS experiment planning and implementation.

e. Attitude maneuver (180 Deg. yaw) planning, coordination, and execution as required to maintain spacecraft thermal & power requirements.

f. Attitude maneuver planning, coordination, and execution as required for instrument calibrations.

g. Orbit maneuver planning, coordination, and execution as required to maintain 350 km circular orbit.

h. Acts as resident expert on TRMM ACS, ACE, Propulsion, Thermal, Power, and other subsystems.

12.1.4 Real-time Operations Supervisor

The Real-time Operations Supervisor is primarily concerned with maintaining the operational status of the control center systems and staff as required to conduct scheduled real-time interaction with the TRMM observatory. Specific responsibilities include:

a. Provides support to the TRMM Integration & Test (I&T) Manager during the prelaunch mission phase.

b. Assists in the prelaunch transfer of project database, displays, and procedures from I&T to the control center for on-orbit operations.

c. Ensures that real-time console personnel are advised and have necessary resources to execute the TRMM Daily Activity Plan (DAP).

d. Provides point-of-contact to support facilities such as FDF, Pacor II, TOC, and the NCC as needed to coordinate real-time operations.

e. Maintains FOT work schedules to ensure adequate staffing for 24-hour, 7-day week operations.

f. Maintains recorder playback data accounting records and provides daily operations status reporting.

g. Maintains configuration control and ensures accuracy of the TRMM Flight Procedures Document (FPD).

h. Provides documentation administration over the TRMM Technical Library.

12.1.5 Mission Planning and Scheduling Analyst

The TRMM FOT will be staffed with two Mission Planning and Scheduling Analysts. The MPS analysts, also referred to as the Mission Planners, are primarily responsible for planning, coordination, and scheduling of mission activities. Specific responsibilities include:

a. Operate MOC offline system as required to perform TRMM mission planning, command management, and scheduling functions.

b. Coordinate with FDF information transfer such as TRMM and TDRS Extended Precision Vectors (EPVs), User Antenna View (UAV) information, Predicted Site Acquisition Tables (PSATs), user transponder Local Oscillator Frequency (LOF) Reports, etc.

c. Ensure proper population and maintenance of MOC Mission Operations Planning & Scheduling System (MOPSS) database.

d. Coordinate instrument operations with external science centers at MSFC, LaRC, and the TRMM Science Data & Information System (TSDIS).

e. Coordinate scheduling of experimental COMETS events with NASDA.

f. Perform all daily CERES instrument command management functions to ensure proper instrument operation and science collection.

g. Operate TDRSS User Planning System (UPS) as required to ensure TDRS resources are scheduled to meet TRMM telemetry, command, and tracking requirements.

h. Maintain configuration control over TRMM stored command definitions (Relative Time-tagged Sequences).

i. Maintain general records of MOC ground system operations as related to mission planning, command management, and scheduling.

j. Perform stored command load management functions including DAP preprocessing, validation, load generation, and report generation.

12.1.6 Real-time Spacecraft Analysts

The Real-time Spacecraft Analysts are the backbone of the FOT. The Real-time Spacecraft Analyst, sometimes referred to as 'Console Analysts', are primarily responsible for the real-time telemetry and command interaction with the observatory. Specific responsibilities include:

a. Participate in prelaunch MOC s/w, h/w, and operational interface testing to ensure functional capabilities and mission readiness.

b. Perform R/T evaluation of S/C engineering parameters specific to power, attitude control, communications, and other TRMM housekeeping systems to ensure observatory health and status is maintained.

c. Uplink S/C commands as necessary to operate on-board solid state recorders and to ensure science data downlink and capture

d. Uplink required stored command and vector loads and verify execution and/or successful on-board storage.

e. Coordinate with the NCC all acquisitions and reacquisitions as necessary to maintain R/T telemetry, command, and tracking operations.

f. Complete and evaluate off-line telemetry playbacks as required for performance trending, power analysis, plot generation, etc.

g. Manage all real-time interaction with NASDA as required to support COMETS experimental events

h. Maintain general console records documenting both real-time spacecraft and MOC ground system operations.